

**BEFORE THE BOARD OF OIL, GAS AND MINING
DEPARTMENT OF NATURAL RESOURCES
STATE OF UTAH**

FILED

MAY 25 2012

SECRETARY, BOARD OF
OIL, GAS & MINING

LIVING RIVERS,

Petitioner,

v.

UTAH DIVISION OF OIL, GAS
AND MINING,

Respondent,

RED LEAF RESOURCES, INC.,

Intervenor-Respondent.

**RED LEAF RESOURCES, INC.'S
EXPERT WITNESS REPORT,
ROBERT J. BAYER,
JBR ENVIRONMENTAL
CONSULTANTS, INC.**

Docket No. 2012-17

Cause No. M/047/0103

I. INTRODUCTION AND QUALIFICATIONS

A. I am Robert J. Bayer, Managing Principal, JBR Environmental Consultants, Inc. ("JBR"), located at 8160 South Highland Drive, Sandy, Utah 84093.

B. Red Leaf Resources, Inc. ("RLR"), has requested me to testify as an expert in these proceedings regarding my work on their behalf to prepare the Notice of Intention to Commence Large Mining Operations, Red Leaf Resources, Inc. Southwest #1 Project ("NOI"). References herein are to the NOI dated September 1, 2011.

C. Summary of Educational and Professional Background.

B.S. Geology, Marrietta College, 1971

M.S. Geology, University of Tennessee, Geology, 1974

Exploration Geologist Conoco Minerals, 1973

Geologist, Tennessee Division of Water Quality Control 1973 to 1975

Exploration Geologist, Getty Mining Company, 1975 to 1985

Principal, JBR Environmental Consultants, Inc. 1985 to present

My CV is attached.

- D. My area of responsibility for preparing the NOI: JBR worked in concert with Norwest Corporation ("**Norwest**"), who was the principal preparer of the NOI. I oversaw JBR staff working on the NOI and reviewed all baseline results, interpretations, and conclusions. I assisted in developing some of the reclamation concepts and reviewed JBR sections of the NOI document. In addition, I have participated in responding to the Utah Division of Oil, Gas and Mining's ("**DOGM**") technical review of the NOI.
- E. My responsibility for preparing the Ground Water Discharge Permit Application ("**GWDPA**"): I worked in conjunction with RLR as the principal author of the document. Certain sections of the GWDPA were prepared by other consultants including Norwest and Intermountain GeoEnvironmental Services, Inc. ("**IGES**").
- F. Status of GWDPA review: RLR's GWDPA dated December 20, 2011, is currently under review by the Utah Department of Environmental Quality, Division of Water Quality ("**DWQ**").
- G. My familiarity with the site of the Southwest No. 1 Mine ("**Project**"): I first visited RLR's pilot project site in 2008 with DOGM management while serving on the Board of Oil Gas and Mining. After JBR was retained by RLR, I visited

the site on two occasions to examine stream conditions and geomorphology.

With regard to hydrogeology, I have reviewed relevant publications on Uinta Basin ground water hydrogeology and available data on ground and surface water quality. These publications are cited in the NOI beginning on page 64.

II. THE PURPOSE AND SUMMARY OF TESTIMONY

A. The purpose of my testimony:

1. My testimony and expert report addresses the NOI, particularly as to ground water resources and the adequacy of the NOI to address the requirements of the Utah Mined Land Reclamation Act, § 40-8-1, and implementing regulations.
2. I will address how JBR worked with RLR and Norwest to prepare the NOI and respond to DOGM's comments. In particular, I will address how the NOI mining and reclamation plan describes ground water resources and potential impacts to those resources as required in R647-4-106.8 (depth to ground water) and R647-4-100.1 (narrative description of ground water impacts).
3. In addition, I will rebut the allegations of Living Rivers regarding the inadequacies in the NOI.
4. Finally, I will address how the GWDPA has been prepared to demonstrate that the Southwest #1 Project will protect ground water quality. The

GWDPA is separate from the NOI and includes significantly more detail regarding ground water quality than the NOI.

- B. In my expert opinion, the NOI as approved by DOGM meets the requirements for approval under the Utah Mined Land Program and is appropriately conditioned upon the issuance of a ground water quality permit by the Utah Division of Water Quality ("DWQ") or upon DWQ's determination no such permit is required.

III. DESCRIPTION OF GROUND WATER RESOURCES—DEPTH TO GROUND WATER

- A. The NOI is written to track the applicable sections of the Utah Minerals Reclamation Program ("Minerals Program") rules which govern the NOI application and approval process. Geologic and ground water resources are described as follows:
1. Chapter II, R647-4-105 maps, drawings and photographs including:
 - a. Figure 13, typical stratigraphic column and density log for the horizons to be mined; Figure 14, surface water resource map; Figure 17, overall geology of Project area.
 2. Chapter III, R647-4-106 Operations Plan including:
 - a. 106.8 Depth of Ground Water, Extent of Overburden Material and Geologic Setting;
 3. Chapter VI, R647-4-109, Impact Statement including
 - a. 109.1 Projected Impacts to Surface and Ground Water Systems.

4. Appendices including:
 - a. Appendix I – JBR Geotechnical Analysis;
 - b. Appendix K – Water Management Strategy;
 - c. Appendix N – Letter—GWDPA;
 - d. Appendix R – Letter re BAS Analysis; and
 - e. Appendix S – GWDPA.
- B. The NOI for the Southwest #1 Facility provides an adequate description of ground water resources to meet the requirements of R647-4-106.8. *See* NOI III.106.8, Depth to Groundwater at pp. 37-38. RLR meets the requirements of R647-4-109 by providing a narrative description of ground water impacts. *See* NOI IV.109.1: Projected Impacts to Surface and Groundwater Systems at pp. 40-42. Groundwater resources are also fully described in RLR's Groundwater Discharge Permit Application ("**Groundwater Discharge Application Permit**"), dated December 20, 2011. *See* NOI Appendix S.
- C. The NOI confirms that records of nearby water wells retained by the Utah State Engineer, Division of Water Rights ("**DWR**") reflect the following: (i) a 1312 foot-deep well drilled in 1978 had a static water level of 475 feet and produced at a rate of 9 gallons per minute during a pump test; and (ii) a 1360 foot deep well producing 17 gallons per minute. NOI p. 38. In addition, RLR has drilled a 900 foot deep well which produces 15 gallons per minute. The NOI provides that ground water is not susceptible to the effects of mining and capsule processing operations because it is isolated by several hundred feet of low permeability marlstone. NOI, p. 42.

- D. The observed depth to ground water is consistent with published reports described in the NOI. *See* NOI, Appendix S.

IV. **PARACHUTE CREEK AND DOUGLAS CREEK FORMATIONS**

- A. The NOI contains an adequate analysis of the Parachute Creek and Douglas Creek members of the Green River Formation. *See* Hydrology Report, NOI, Appendix S, p. 13. The NOI reports no USGS-mapped springs issuing from these formations. A more detailed seep and spring inventory is not required by the Minerals Program rules. However, water sources identified from published sources and located within a one-mile radius of the mine operations are identified at Figure 3, Appendix S, Groundwater Discharge Permit Application.
- B. RLR encountered little water in drilling its six exploration core holes. Water was encountered during drilling in one hole, RL-1, which is the southern-most hole drilled (Figure 6). The water occurrence was reported to me by a Norwest geologist as occurring in the uppermost part of the drill hole and related to surficial factors involving weathering and local geomorphic conditions. Water flow into the borehole from this horizon reportedly ceased before the hole was completed. The results of RLR's exploration drilling are summarized in the NOI, and the full well logs are set forth at Figure 6 of the Groundwater Quality Discharge Application, Appendix S.
- C. The NOI provides a summary of nearby water wells on file with the Utah Division of Water Rights, Appendix S, p. 21. The location of these wells is clearly identified in the State Engineer's database for each water well.

V. ISOLATION OF GROUND WATER

The NOI confirms that ground water is isolated from RLR's operations by several hundred feet of low permeability marlstone. NOI at p. 42. WRA cites the NOI for the statement that the first porous unit occurs some 50-100 feet below the Mahogany zone. Actually, the NOI cites Holmes and Kimble regarding the occurrence of sandstone units comprising the top of the Douglas Creek Member of the Green River Formation. NOI at p. 42. Available water well data cited no occurrence of water at this depth.

VI. B-GROOVE IS UNSATURATED IN THE MINE AREA

- A. The hydrogeology report set forth in the GWPDA fully addresses the B-Groove horizon, which is recognized as a water-bearing unit in the Piceance Basin to the east in Colorado. NOI, Appendix S. Red Leaf's six exploration holes were drilled through the B-Groove horizon without encountering water. In fact, in drill holes the B-Grove horizon is only recognized by its position relative to the Mahogany Zone. The lithology representing the B-Groove horizon at the RLR project site is a mudstone. Conversely, the B-Groove in the Piceance Basin, where it is known as a water-bearing unit, is described as a fractured mixed sandstone/shale/marlstone unit. NOI, Appendix S.
- B. The DOGM rules require description of impacts to "ground water systems" (R647-4-109(1)). The NOI and the GWPDA identify known ground water occurrences and evaluate the potential for impacts to ground water systems. Based upon review of the geologic logs of drill holes prepared by Norwest and

discussions with a Norwest senior geologist, the B-Groove horizon has been identified and found not to be part of any ground water system.

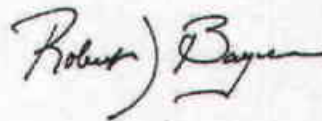
VII. GROUND WATER DISCHARGE PERMIT APPLICATION

- A. JBR has primary responsibility on behalf of RLR for meeting with the DWQ, determining the need for a ground water discharge permit, the type of permit (by rule or application) and the need for a construction permit.
- B. Following is a brief chronology of discussions and interactions with DWQ:
 - 1. A pre-design conference was held at the Utah Department of Environmental Quality ("DEQ") offices on August 4, 2010 and attended by RLR and its consultants, as well as representatives of DEQ, including DWQ, and DOGM. At that meeting, I explained to attendees my reasoning that the proposed process operations facility at the Southwest #1 Mine may not be one that qualifies for regulation under the Utah Ground Water Quality Protection rules.
 - 2. Subsequently, JBR prepared a document, dated August 4, 2010, describing the reasoning that the Southwest #1 Mine using the EcoShale process is not a facility requiring a ground water discharge permit, based upon DWQ's requirements. NOI, Appendix N. Upon review of that document, DWQ subsequently determined that RLR must submit a GWPDA

3. A GWPDA dated December 20, 2011 prepared by JBR on behalf of RLR was submitted to DWQ. A copy of the GWPDA is provided in the NOI, Appendix S.
4. DWQ is currently reviewing the GWDPA.

VIII. CONCLUSION

- A. In my opinion, RLR's NOI fulfills all of the requirements of the applicable Division rules and regulations under the Minerals Program. The Division properly conditioned the NOI upon DWQ's further determination regarding the need for an approved GWPDA.



ROBERT J. BAYER

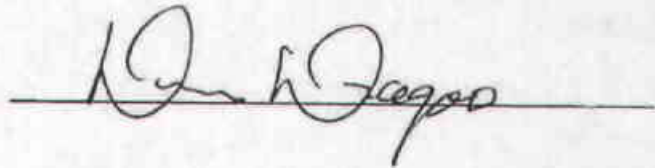
CERTIFICATE OF SERVICE

I hereby certify that on May 25, 2012 a true and correct copy of the foregoing **RED LEAF RESOURCES, INC.'S EXPERT WITNESS REPORT, ROBERT J. BAYER, JBR ENVIRONMENTAL CONSULTANTS, INC.**, was served by e-mail and U.S. mail, postage prepaid, to the following:

Jaro Walker, Esq.
Charles R. Dubuc, Esq.
Western Resource Advocates
150 South 600 East, Suite 2A
Salt Lake City, Utah 84102

Steven F. Alder, Esq.
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Julie Ann Carter, Docket Secretary
Michael Johnson, Esq.
Utah Board of Oil, Gas and Mining
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A handwritten signature in black ink, appearing to read "Michael Johnson", is written over a horizontal line.

Robert Bayer, PG
President JBR Environmental Consultants, Inc.
M.S., Geology, University of Tennessee
B.S., Geology, Marietta College

Mr. Bayer is a licensed Professional Geologist who has more than 35 years of experience in the environmental and mining industries. He is a founder and President of JBR Environmental Consultants, Inc., with offices in Utah, Nevada, Idaho, Montana, Washington, Oregon and Arizona. Prior to forming JBR, he worked in the mining industry doing exploration geology throughout the United States. He also worked for the Tennessee Division of Water Quality Control where he helped established the state's coal mine water quality protection program. Bob has managed a large number of mine permitting projects involving energy, metallic mineral resources and industrial minerals in the Great Basin and on the Colorado Plateau. For the last several years he has been heavily involved in consulting to oil sand and oil shale clients in the Uinta Basin. He served two 4-year terms on the Utah Board of Oil Gas and Mining and his final term ended in 2009. He is an active participant in the environmental activities of the Utah Mining Association and serves on its Board of Directors. He is a member of a number of professional organizations including the Society of Petroleum Engineers, the Association of Ground Water Scientists and Engineers, and the Society for Mining Metallurgy and Exploration. Bob is a 32-year resident of Utah.

Areas of Expertise

Mine & Industrial Permitting & Compliance
Geochemical & Hydrogeochemical Investigations
Ground Water Studies
Oil & Gas Exploration & Development Impact Assessment
Oil Shale & Tar Sands Permitting & Pre-Feasibility

Education

- M.S., Geology, University of Tennessee, 1974
- B.S., Geology, Marietta College, 1971

Professional History

- JBR Environmental Consultants, Inc., Managing Principal, Vice President, Geologist-Geochemist, 1985 - Present
- Getty Mining Company, Exploration Geologist, 1975 - 1985
- Division of Water Quality Control, Geologist, 1973 - 1974
- Conoco Minerals, Geologist, 1973 - 1973
- University of Tennessee, Geology Department, Research Assistant, 1972 - 1973

Licenses

- Professional Geologist, UT
- Professional Geologist, WY

Supplemental Training

- Ground Water Geochemistry

- Oil and Gas Law and Regulation
- Geochemical Modeling (PHREEQE)
- NEPA and Federal Land Development

Affiliations

- Association of Ground Water Scientists and Engineers
- Board of Directors, Utah Mining Association
- Chair, Environmental Committee, Utah Mining Association (UMA)
- Member, UMA Oil Shale & Tar Sands Committee
- Rocky Mountain Mineral Law Foundation
- Society of Petroleum Engineers
- Utah Board of Oil, Gas, and Mining (completed 2nd and final 4-year term in February)

Mr. Bayer has more than three decades of experience in the environmental and minerals industries. He is a founder, shareholder, and Managing Principal of JBR Environmental Consultants, Inc. and is responsible for overall management of the company. His environmental industry experience includes the following: management of multimedia permitting projects for coal, ferrous and non-ferrous metallic and non-metallic mining operations, as well as for industrial facilities; managing and conducting environmental investigations, and management and technical review of environmental due diligence and audit projects. In addition, he is currently involved in permitting projects for both oil shale and tar sand projects on the Colorado Plateau. His due diligence experience includes: mine and mills; roasters, smelters, and refineries; oil and gas fields, gathering systems, and natural gas plants; and land disturbed and affected by abandoned mines and related facilities.

His environmental investigation experience has included investigations of sites contaminated by heavy metals; PCBs; fuels and lubricants; solvents; and asbestos. He has conducted geochemical investigations of contaminated soils, fill, and related media as well as hydrogeochemical investigations of contaminated groundwater and surface water. Subsequent to investigations, Mr. Bayer has managed remediation planning, design and cost estimate preparation for numerous facilities in the western U.S. He has extensive regulatory permitting and compliance experience involving state programs authorized under federal legislation including the Clean Air Act (CAA), the Clean Water Act (CWA), the National Environmental Policy Act (NEPA) and the Resource Conservation and Recovery Act (RCRA). He has provided expert witness services to private and public sector clients, including the U.S. Department of Justice and the U.S. Attorney for the State of Utah.

MINE & INDUSTRIAL PERMITTING & COMPLIANCE

Mr. Bayer managed and participated in more than a dozen mine and industrial permitting projects in multiple states, including Utah and Nevada. Mine projects have included coal; gold; copper; lead/zinc and non-metallic minerals aggregate mining; base metal smelting; precious metals roasting; chemical manufacturing; and fabricating plants. Permitting experience in Utah and Nevada includes participation in and management of the preparation of permit application packages for the Cyanco Winnemucca Sodium Cyanide Plant; Barrick Mercur Gold Mine; Barrick Bullfrog & Goldstrike Mines; SF Phosphates Vernal Phosphate Mine; Barneys Canyon

Gold Mine; Tenneco/USMX Goldstrike Mine; Inspiration Gold; Topaz Beryllium Project; Brush Resources/Topaz Beryllium Mine; 6 Utah coal mines; and ongoing projects involving copper, precious metals, oil shale, and tar sands in operation or in development. Services provided on these projects have included: preparation of mining and reclamation plans; ground water, construction permits, and storm water permits; air quality emission inventories and construction permits; and various other state agency and local government permits. He has assisted clients with compliance issues related to air quality permits, ground water discharges, applicability of storm water regulations to mining sites, discharge limitations, site-specific ground water protection limits, and interpretation of water quality data collected in permit-required monitoring activities.

GEOCHEMICAL & HYDROGEOCHEMICAL INVESTIGATIONS

Mr. Bayer has conducted geochemical and hydrogeochemical investigations at contaminated sites, sites with suspected contamination, and predictive studies for assessment of impacts by proposed mining operations. Types of sites investigated have included: undeveloped property where past contamination was suspected or mobilization of naturally occurring metals in soils and alluvium by future industrial activities was a concern; evaluation of potential impacts to soil and ground water from proposed phosphate mining operations, former landfill sites contaminated by volatile and semi-volatile organic compounds and metals with potential impacts to surface and ground water; former and active industrial sites where contamination of soils by metals, solvents and fuels was a concern; and abandoned metallic mining and milling sites with concerns for contamination by acid-rock drainage, metals, cyanides, and milling reagents. The types of investigations that Mr. Bayer has planned, conducted, and directed include: numerous geochemical and hydrogeological sampling projects in soil, bedrock, and ground water; evaluations of geochemical and hydrogeochemical data, including interpretation using various statistical applications; and, pathway and fate evaluations for metallic and organic chemicals in soils and ground water.

GROUND WATER STUDIES

Mr. Bayer has directed and carried out ground water investigations involving contaminant source identification, determination of surface water and ground water interactions, investigation of complex bedrock ground water systems, identification and evaluation of compartmentalized ground water systems, and contaminant fate and transport. Investigational methods have included installation of monitor wells, piezometers, seep and spring measurements, and geologic mapping. He has experience with most drilling methods including conventional and reverse rotary, auger, wire line coring, and direct push.

OIL SHALE & TAR SANDS PERMITTING & FEASIBILITY

Mr. Bayer is the currently managing the environmental component of a major pre-feasibility study for a potential large oil shale project located in eastern Utah. This confidential project involves assessing the environmental and socioeconomic aspects of a large mine and processing facility and the related operational infrastructure, as well as effects on community infrastructure. Mr. Bayer also participates as a senior advisor on other oil shale and tar sands permitting projects

currently underway. He is an active participant in the Utah Mining Association's Oil Shale and Tar Sands Committee as well as being a regular participant in the Uinta Basin Oil and Gas Collaborative Group. Through these activities and his past membership in the Utah Board of Oil Gas and Mining, Mr. Bayer maintains a state-of-the industry understanding of all aspects of oil shale and tar sands, as well as conventional petroleum and natural gas E&P, technological, environmental, and public policy-related issues.